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# WARS AND INCREASED SOLAR-GEOMAGNETIC ACTIVITY: AGGRESSION OR CHANGE IN INTRASPECIES DOMINANCE?[1]

M. A. PERSINGER

*Laurentian University*

*Summary.*—Human beings are extremely aggressive animals who are emersed within a steady-state geomagnetic field. A small component of this field displays periodic changes in amplitude. Symmetrical lag/lead analysis (–6 years to +6 years) in the present study, involving annual global geomagnetic activity, inferences of solar activity, and the release of the total, global seismic energy indicated that the numbers of armed conflicts (wars) for the first half of the twentieth century were moderately associated (*r*s approximately .50; 25% of the variance) only with the global geomagnetic activity of the same year. When the residuals between the predicted annual geomagnetic activity from the solar cycle and the observed geomagnetic activity were allowed to enter the equations, a comparable proportion of the variance in numbers of wars was accommodated. A factor associated with geomagnetic activity might, it is speculated, modulate changes within emergent processes that control the relative dominance of large aggregates of humans. Wars may have been the more obvious manifestations of these changes.

According to Parrish and Edelstein-Keshet (1999) aggregations of individuals of a species function as an integrated whole. Emergent properties are considered a hallmark of animal aggregations. Large populations of units can self-organize into aggregates that store information and engage in collective decision-making. Aggregations can be either "self-organized" or form in response to the environment. The characteristics of the stimuli that affect aggregate behaviours are often subtle or unclear. Intuitively, the spatial extent of these stimuli should circumscribe the aggregate.

If one assumes the biological patterns of the human species do not differ from other terrestrial lifeforms, then it should display aggregate behaviours. One of these behaviours may be transient intraspecies aggression most frequently described as war. Since the year 1500, approximately 150 million humans have died during armed conflicts between nations (Sivard, 1991). The indirect consequences, including disease and famine, are very likely to have involved additional hundreds of millions. Consistent with the egocentric nature of individual cognition and the ethnocentric perspective of groups, the primary causes for these massive killings have been attributed to the motives of groups or their leaders. The possibility that wars, as aggregate phenomena, may be self-organizing or form in response to unspecified environmental stimuli has not been addressed.

[1]Please send reprint requests to Dr. M. A. Persinger, Behavioral Neuroscience Laboratory, Department of Psychology, Laurentian University, Sudbury, Ontario, Canada P3E 2C6.

Human beings are emersed within the earth's magnetic field. Although the primary steady-state strengths are relatively constant over time, approximately 11-yr. periodicities occur in the amplitude of the time-varying component. The temporal (years) and spatial (large areas of the earth) increments of this cyclic variation suggest these changes in geomagnetic activity may contain recondite zeitgebers for aggregate behaviours. The temporal contiguity of these modulators would only be evident when behaviours, such as wars, displayed by these largest aggregates were analyzed.

We (Persinger, 1997a; St-Pierre & Persinger, 1998a) have replicated correlations of about .40, between increases in global geomagnetic activity and aggression in groups of rats that exhibit electrical sensitivity or lability within the limbic (temporal lobes) systems. The group aggression was most easily evoked experimentally when the synthetic fields simulated the temporal complexity of geomagnetic patterns (St-Pierre, Persinger, & Koren, 1998). The threshold of the intensity to elicit aggressive behaviours in groups of rats by experimental magnetic fields decreased as the density of rats increased within the same ecological space (Persinger, Lafreniere, & Ossenkopp, 1974). The purpose of the present study was to discern whether there were any statistically significant associations between annual values for geomagnetic activity and the magnitude of aggregate aggression as inferred by the numbers of wars.

## Method

As a preliminary test of the hypothesis that aggressive behaviours between large groups of humans should be correlated with a variable that pervades the ecological unit, the numbers of annual conflicts ($M = 8.8$, $SD = 7.5$) throughout the world (Sivard, 1991) were obtained for the years 1904 (first year of calculations of release of global seismic energy) through 1950. The three environmental annual variables were solar activity, as inferred by the average numbers of Wolf sunspots per year ($M = 51.9$, $SD = 38.5$) geomagnetic activity, as measured by the aa ($M$ antipodal index = 18.9, $SD = 5.1$), and the log base 10 of the amount of total global seismic energy release (Gutenberg & Richter, 1965) ($M = 1.04$, $SD = .28 \times 10^{26}$ ergs). The solar-geomagnetic data were obtained on-line from appropriate WEB sites and were verified from published texts (e.g., Mayaud, 1973).

Temporally Symmetrical lag/lead multiple regression analyses were completed by computing 12 lags for each of the environmental variables and lag 6 for the total numbers of conflicts and the square-roots of these values (to reduce the effect of the two world wars). Consequently, if a lag for environmental variables less than 6 entered the equation, the wars preceded the solar-geophysical variable; if the lag was greater than 6, the environmental variable preceded the wars. All analyses involved SPSS software.

## Results

The results showed that the same (two) variables entered the equation for both the numbers of conflicts and the square root for the numbers of conflicts. These variables were the geomagnetic activity of the same year as the conflict (beta = .50, .48) and the amount of global seismic energy release (beta = .33, .33) six years later ($F_{2,35} = 6.54$, 6.13; $p < .01$). The multiple $r$ values for the two equations were .54 and .53, respectively; however, the Durbin-Watson value was < 1.00 and suggested a strong autocorrelation (Eastman, 1984). Because the correlations between years and the aa values (.64) and numbers of wars (.31) were significant statistically, further analyses were completed. The partial correlation between aa values and numbers of conflicts after the serial effect (year) had been removed was still significant (partial $r = .36$, $p < .01$). Whereas the partial correlation between the years' aa values was significant ($r = .52$) after the numbers of human conflicts were first removed, the association between years and numbers of conflicts per year was not significant statistically ($r = .08$) after the variance associated with annual geomagnetic activity was removed.

To support the importance of the geomagnetic component residuals between the observed annual aa values and the predicted values from solar activity ($r = .66$) during the previous year were calculated. When the aa value and the residuals of the same year and the previous year were allowed to enter the equations, the multiple $r$s ($df$s = 3, 41) were .53 ($F = 5.34$, $p < .01$) for numbres of wars and .54 ($F = 5.49$, $p < .01$) for the square root of the numbers of wars. All slopes were positive and the dominant variable was the residual (larger aa values than predicted by numbers of sunspots) for geomagnetic activity during the previous year. A partial correlation of .36 ($p = .01$) was still present between the residuals of the observed and predicted geomagnetic activity as a function of year and the residuals of the observed and predicted numbers of wars.

## Discussion

The magnitude of the association between very aggressive behaviours by large aggregates within the human species, as inferred by the numbers of wars, and the intensity of annual geomagnetic activity was similar to the values for correlations that we have observed in our experimental model of group aggression (St-Pierre, *et al.*, 1998). Although the present study was correlational and hence causation cannot be determined, the fact that the relationship was present despite crude annual averaging of variables suggests that some factor or factors associated with these ubiquitous geophysical processes might influence the emergent properties within human aggregates that result in war. Because there are also data (Persinger, 1997b) that human experiences associated with religious convictions may be employed as rational-

izations for killing individuals from other aggregates, the existence of ecological variables that encourage the limbic lability associated with these beliefs could compound this risk.

Although solar activity is the major zeitgeber for global geomagnetic activity, the present results, which did not identify a significant contribution from solar activity to the variance in numbers of wars per year, suggest that geomagnetic activity may be involved with the more direct variables. Symmetrical lag/lead (–5/+5 years) analysis for the first 97 years of this century indicated that the strongest correlations (Pearson *r* and Spearman *rho*, respectively) were between aa values and the numbers of sunspots the year before (.66, .70) and two years before (.65, .63). This 1- to 2-yr. lag would be consistent with historical beliefs before geomagnetic activity was measured systematically, that more wars occur after the peak in solar activity.

The results of this study indicate that factors associated with enhanced geomagnetic activity, even when separated from the conspicuous solar cycle, may have facilitated aggressive behavior during the first half of the twentieth century. However, the peaks in geomagnetic activity after 1950 have not always been associated with episodes of major wars. The years in which the peak average annual geomagnetic activity occurred after 1950 were 1951, 1960, 1974, 1982, 1989, and 1991 (the highest value this century). During the year 1982 the largest population aggregate, China, reconstructed its government while during 1989 a sudden collapse of socialism occurred in Eastern Europe. The year 1991 was associated with the disintegration of the Soviet Union and the Iraq (Gulf) War. These mass behaviours might also be described as changes in the hierarchy between aggregates (nations) and the functional organization of those aggregates.

A temporally contiguous association between the numbers of wars and the release of global seismic energy was not apparent in the present study. The only variable that entered the equation during the lag/lead analysis indicated that the numbers of wars increased about six years before increases in global seismic energy. Although obviously the partial correlation with the residual in numbers of wars does not mean wars caused earthquakes, the possibility might be considered that transient surface forces (Persinger & Lafreniere, 1977) produced by accumulating tectonic strain under large areas (before the values reached fracturing potential) affected aggregate phenomena.

This experimenter's unpublished analyses have indicated two major types of human behaviours are associated with earthquake activity within regions in the order of a million square km. The first appears to be the consequences of several earthquakes of moderate magnitude or one of large magnitude upon the social structure of countries with smaller areas and with limited economies. The most common consequence has been insurrection or internal conflict within two to three years after these natural disasters. The

other type of human phenomenon appears to be a general social agitation, manifested as riots and mob behaviours for several years *before* the occurrence of larger earthquakes. Because tectonic strain is affected by regional forces, the quantitative association with the numbers of wars might have been masked by the global measures employed in this study.

Two major implications emerge from the results of the present analysis that may be relevant for the next two likely peaks in geomagnetic activity during the years 2001 and 2002 and 2012 and 2013. First, the human species can be viewed as an aggregate of organisms emersed within a steady-state geomagnetic field. Small as yet unmeasured influences from factors associated with geomagnetic activity might, it is proposed, modulate the subtle gestalt processes that emerge from interactions within large groups of individuals (Persinger, 1983). Secondly, these perturbations might induce changes or reorganizations within the social hierarchies that define access to and control the competition for rewards and punishments within the human species. From this context, one may speculate wars may have been the conspicuous manifestations of changes in the national hierarchies of human aggregates.

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